WORK PLAN

Evaluation of Spruce Budworm Outbreaks with Pheromone Traps

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Portsmouth, NH
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WORK PLAN

EVALUATION OF SPRUCE BUDWORM OUTBREAKS WITH PHEROMONE MOTH TRAPS

INTRODUCTION

Background

Spruce budworm, Choristoneura fumiferana (Clem.), outbreaks usually are first detected during defoliation surveys. Thereafter, insect population densities and predictions of damage are based on either egg mass sampling data, or more recently from overwintering larval (L_2) counts. These population estimates are time consuming, expensive and provide information rather late in the fall.

Research scientists have developed pheromone traps to attract and capture male spruce budworm moths. These traps are being evaluated through the CANUSA program to detect budworm buildups during the pre-outbreak low population density phases. The proposed project will be designed to adapt the low population pheromone trap methods for evaluation of high population densities where needs for control need be determined.

Justification

Spruce budworm population predictions are necessary for the integrated spruce budworm management program. These predictions are necessary to determine need for suppression in time to plan next season's activity. The proposed pheromone moth trap survey method, if successful, would provide needed predictions at lower cost and about a month earlier, than the presently used egg mass surveys and overwintering larval surveys provide. The proposed method was developed by CANUSA research, and the field evaluation is designed to adapt the method for operational spruce budworm control.

Objective

The ultimate objective will be to predict spruce budworm defoliation levels and population changes with male moth catches in pheromone traps. This objective will be achieved by correlation of moth catches with egg mass population densities, L_2 population densities, L_{3-4} population densities and the resultant severity of defoliation. The objective will be achieved when survey data show that the pheromone trap estimates give equal to or better predictions than the presently used methods.

METHODS

Sampling Design

Areas: The pheromone trap evaluation will be conducted on Passamaquoddy and Penobscot Indian lands in Maine. These areas are being evaluated, and sprayed when necessary, to prevent tree mortality from spruce budworm damage.

The Penobscot lands are located in Alder Stream Township near Eustis in western Maine. The Passamaquoddy lands are in T5ND, near Princeton, in eastern Maine. Both of these areas have spruce-fir stands planned for spraying with Bt (Bacillus thuringiensis) in 1982. Part of the evaluation will be in the sprayed areas and part of it in nearby unsprayed stands. All the sampling will be done in areas where the survey data can be used for both evaluation of the spraying and for the evaluation of the pheromone moth traps.

Stands: The spruce and fir in the proposed areas are dispersed in stands of various levels of composition. Since the fir in these areas frequently is present as a minor component, or even killed out by the budworm, the spruce is probably the major host tree supplying the budworms in the area.

Predominantly spruce stands will be chosen in both areas in sprayed and unsprayed stands. In the softwood type (60 percent or more of spruce-fir) both spruce alone and spruce-fir stands will be chosen. In the mixed wood (30-60 percent spruce-fir) type, only spruce stands will be chosen (Table 1).

Sample Clusters, Points and Trees: Average spruce budworm populations and defoliation will be determined from 3 cluster samples for each area, stand or treatment. Sub samples in a cluster will be taken from two trees at each of the 5 sample points.

Sample points will be chosen at the center of the cluster and one each about 2 chains away in the four cardinal compass directions.

Two sample trees for each species sampled will be marked at each point. The trees should have adequate crown for sampling over a 3 year period and should occupy dominant or codominant crown position in the stand.

The sample trees should be labeled for cluster number, sample point, species and tree number.

Cluster - Penobscot P1 -P15

Passamaquoddy Q1 - Q6

Sample Point - Center (C); N; E; S; W

Species - Spruce (S); Fir (F)

Tree - 1 or 2

Sample label -

A 1 N S 2 (Alder Stream, Cluster 1, North point, Spruce, Tree 2)

In some areas where both spruce and fir sample trees are available, two clusters - one for each species - may be established at the same location. There, 4 trees - two of each species - will be marked at each sample point.

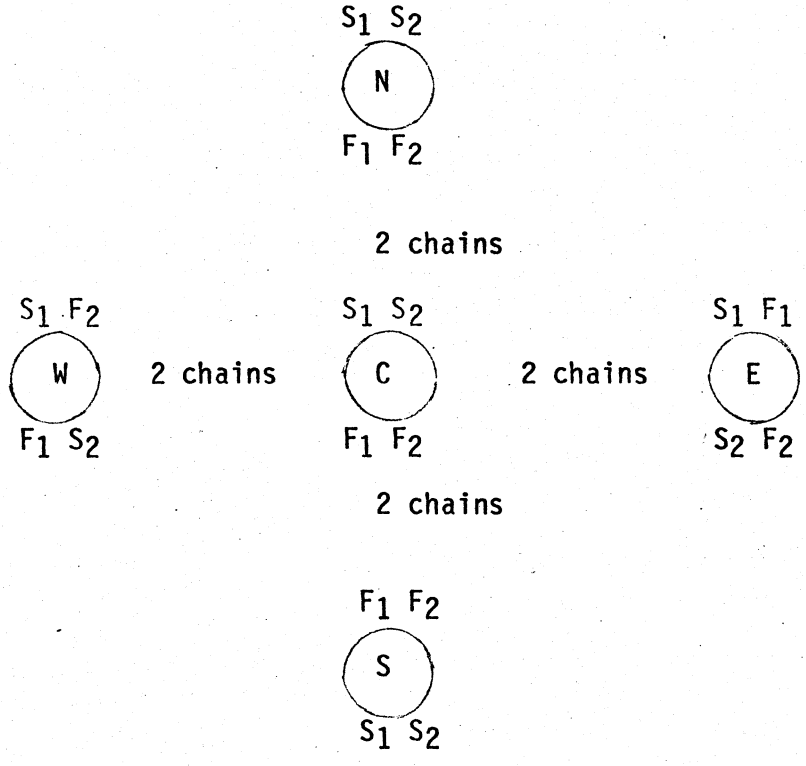


Figure 1. Diagram of a cluster of sample points and spruce and fir sample trees.

Table 1. Sampling design for prediction of spruce budworm populations and defoliation - Pheromone Study, Maine.

Sample Items	Western Maine								Eastern Maine				Total		
	Softwoods				Mixed woods				Softwoods						
	Spray		Unspray		Spray		Unspray		Spray		Unspray				
	S	F	S	F	S	F	S	F	S	F	S	F	W	E	T
No. sample clusters	3	3	3	3	3	-	3	-	3	-	3	-	18	6	24
Sub samples:															
Points-5/cluster	15	15	15	15	15	-	15	-	15	-	15	-	90	30	120
Tree-2/point	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Prespray-1/point	15	15	15	15	15	-	15	-	15	-	15	-	90	30	120
Branches:															
L_2-1/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
L_4-2/tree	60	60	60	60	60	-	60	-	60	-	60	-	360	120	480
Pupal-2/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Egg mass-2/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Pheromone traps:															
1/point	15	15	15	15	15	-	15	-	15	-	15		90	30	120

S - Spruce
F - Fir
W - West
E - East
T - Total

Survey Methods

Pheromone Moth Traps: The pheromone traps will be of the same design as those used by research in the CANUSA program (Final Work Plan, Scope of Work for 1982 SBW Pheromone Project, CANUSA as prepared by Dr. D. Allen, Syracuse University). The traps will be set out in the same design as specified by Dr. Allen.

One trap will be placed at each sample point (5 per cluster) about the end of June, during the pupal survey in 1982. In the following years, 1983 and 1984, the trap deployment will be timed to about a week before moth emergence begins. The traps will be collected during the egg mass survey in August. Trap contents, the moths, will be placed in 70% alcohol and delivered to the Portsmouth Field Office for examination and counting. Collection for each point will be labeled for cluster, point and collection dates.

Egg Mass Survey: Egg mass population estimates will be made in the laboratory from 18 inch long branches collected in the field. Two branches will be collected from the midcrown of each tree. Each egg mass will be evaluated for parasitism:

0 - less than 5% eggs parasitized

1 - 5% to 40% parasitism

2 - 41% to 60% parasitism

3 - 61% to 90% parasitism

4 - More than 90% parasitism

A sample of 10 egg masses per cluster will be collected to determine the number of eggs per egg mass.

Overwintering (L_2) Survey: One whole branch will be collected from the midcrown of each sample tree, bagged, labelled and delivered to the Portsmouth Field Office. Overwintering larval population will be determined using the soaking technique prescribed by CANUSA (see Sanders, 1980. Great Lakes Forest Research Centre, Pub. O-X-306). Branches may be collected after September 1 and stored in a cool place until examination.

Spring Larval (L_4) Survey: Active larval population estimates will be made from 2-18 inch long branches collected from the midcrown of each sample tree. In 1982, only 1 of the 2 trees will be sampled. Both trees will be sampled in 1983 and 1984, since moth trapping will have occurred beforehand. Branches will be collected, placed in paper grocery bags and aggregated in plastic bags. Samples from each point may be combined. Larval examination will be done at the Portsmouth Field Office.

Pupal Survey: Pupal survey will be made only in 1982 to provide efficacy data for the Bt Suppression Project. Two branches, 18 inches long, will be collected from each sample tree. In the field, the number of large larvae, pupae and emerged pupal cases will be determined and recorded.

Defoliation Estimates: Two types of defoliation estimates will be made. During the pupal and egg mass surveys, estimates of current shoot defoliation will be made for the whole branch as follows:

0 - less than 5% defoliation

1 - 5% to 40% defoliation

2 - 41% to 60% defoliation

3 - 61% to 90% defoliation

4 - more than 90% defoliation

During the overwintering larval survey (L_2), defoliation estimates will be made according to the methods prescribed in the CANUSA work plan (Sanders, 1980. Great Lakes Forest Research Centre, Pub. O-X-306).

Work Schedule

The sample clusters will be established during the Bt Suppression Project. The 1982 survey schedule is planned to provide data for both the Bt project evaluation and for the pheromone trap evaluation. Thereafter, sampling will be done primarily to evaluate the trap method, but the data will also be used for spruce budworm population appraisal on Indian lands. The detailed work schedule is shown in Table 2.

The project will provide data each year for the preparation of a progress report. At this time, the need for continued sampling will be reevaluated.

Data Analysis

The primary analysis will be directed toward determination if the Pheromone Moth Trap population predictions of L_4 and defoliation are significantly different than the predictions based on egg mass surveys and overwintering larval (L_2) surveys. Comparisons will be made using both cluster averages and sample point averages. Both grouped and paired tests will be made to determine if the differences in the mean estimates are statistically significant. Differences at probability levels of 90 percent or greater will be accepted as significant.

BUDGET

The detailed cost estimates are shown in the Project Work Plans and the Summary. Briefly, in addition to the salaries of the personnel from the Portsmouth Field Office, the following additional funds will be required:

FY 1982	$ 8,400
FY 1983	11,750
FY 1984	8,425
Total	$ 28,575

Table 2. Pheromone Study Work Schedule

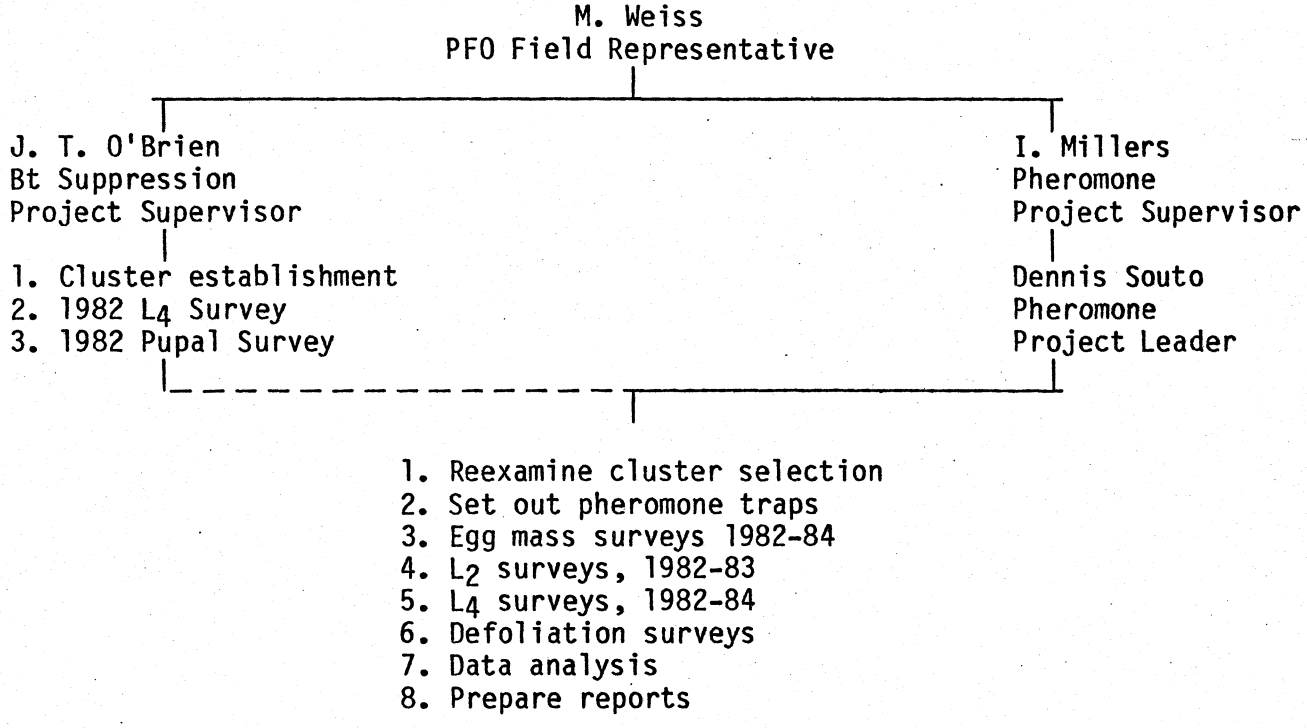
Month	Year 1982	1983	1984
May/June	L_4 Prespray	L_4	L_4
July	Pupal/defol. Moth traps	- Moth traps	- Moth traps
August	Egg mass	Egg mass	Egg mass
September	L_2/defol.	L_2/defol.	-
December	Progress report	Progress report	Final draft

In the event that funds are not available after FY 1982, the project will be terminated and a final report will be prepared.

REPORTS

The Work Schedule (Table 2) shows that a Progress Report will be prepared in 1982 and 1983. The 1984 data will be incorporated with the previous data and a final report draft will be completed by December, 1984.

PERSONNEL AND ORGANIZATION



Attached Project Work Plans show estimates of work and personnel needs.

APPENDIX A

Project Work Plan Forms 1900-A

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT PFO

SUB-UNIT FPM

PROJECT NO. SBW Pheromone

FISCAL YEAR 82

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Establish Pheromone Plots -
Develop plan
Construct Traps
Select + establish plots

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Dennis Souto	27			
Saufley	22			
Snowden	12			
McCreery	12			
PER DIEM, TRAVEL AND MEALS 50 days @ $50/day			2500	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
FS vehicle - 1		2000	0.25	500	
2		2000	0.25	500	

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE		
Traps to build	100		10.-	1000	
No Pest strips	100		1.00	100	
CONTRACT					
TOTAL PLANNED COST	FINANCED + CONTRIBUTED				

BEGIN WORK	COMPLETE WORK
Mar 1	July 1

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY — DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

Use this space for expansion of data shown in the blocks on the other side or for other notes.

INSTRUCTIONS

GENERAL:

This form is used to document plans for direct project work. It may also be used to allocate funds from unit to subunit for approved projects.

Direct project work is defined, and additional instructions for use of form 1900-4 in annual work and financial planning are provided, in FSM 1940 and 6520.

This form should be completed in long hand rather than typewritten. Number of copies depends on distribution on each unit.

If a project extends into two or more fiscal years, a separate 1900-4 will be made for the work planned during each fiscal year.

SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

f. List materials, tools, and supplies needed for the project, quantities to be purchased from project funds and on hand, and unit prices. Enter costs of materials and tools to be purchased in the **To Be Financed** column and estimated value of materials on hand in the **Contributed** column. Do not enter any contributed value for tools or equipment that are on hand and will not be used up or worn out on the project. If more space is needed, use a supplemental page.

g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. | FISCAL YEAR 82

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Pupal survey and set out Pheromone traps.

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Soucto	15			
Lawley	15			
Snowden	15			
McCreery	15			
PER DIEM, TRAVEL AND MEALS 60 × $50/day			3000	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
FS vehicles 1		3000	0	125	750
2		3000	0	125	750

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE	
Misc.			$5/plot	500

CONTRACT	
TOTAL PLANNED COST (FINANCED + CONTRIBUTED)	

BEGIN WORK: June 20 | COMPLETE WORK: July 10

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY | DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

Use this space for expansion of data shown in the blocks on the other side or for other notes.

INSTRUCTIONS

GENERAL:

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Direct project work is defined, and additional instructions for use of form 1900-4 in annual work and financial planning are provided, in FSM 1940 and 6520.

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If a project extends into two or more fiscal years, a separate 1900-4 will be made for the work planned during each fiscal year.

SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

f. List materials, tools, and supplies needed for the project, quantities to be purchased from project funds and on hand, and unit prices. Enter costs of materials and tools to be purchased in the **To Be Financed** column and estimated value of materials on hand in the **Contributed** column. Do not enter any contributed value for tools or equipment that are on hand and will not be used up or worn out on the project. If more space is needed, use a supplemental page.

g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. | FISCAL YEAR 82

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Egg Mass Survey, Defoliation collect traps

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN				
Souto - Field	12			
Lab	10			
Soufley - Field	12			
Lab	10			
PER DIEM, TRAVEL AND MEALS 24 x 50 = 1200			1200	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
FS Vehicle 1		2000	@	25	500

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE	
Misc				100

CONTRACT

TOTAL PLANNED COST — FINANCED + CONTRIBUTED

BEGIN WORK: Aug 1 | COMPLETE WORK: Aug 30

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY — DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

PLANNING AND ACCOMPLISHMENT NOTES

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c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

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g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. | FISCAL YEAR 83

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Overwintering larval survey (1 & 2)
collect branches soaking larvae

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Santo - Field	25			
" " Lab	10			
Sawfly Crew - Field	25			
" Lab	10			
PER DIEM, TRAVEL AND MEALS 50 x 50			2500	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
Vehicle		5000	0.25	1250	
Snowmobile		20 days	35/day	700	

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE		
Misc				500	
CONTRACT					
TOTAL PLANNED COST	FINANCED + CONTRIBUTED				

BEGIN WORK Feb 1 | COMPLETE WORK March 30

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY | DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

Use this space for expansion of data shown in the blocks on the other side or for other notes.

INSTRUCTIONS

GENERAL:

This form is used to document plans for direct project work. It may also be used to allocate funds from unit to subunit for approved projects.

Direct project work is defined, and additional instructions for use of form 1900-4 in annual work and financial planning are provided, in FSM 1940 and 6520.

This form should be completed in long hand rather than typewritten. Number of copies depends on distribution on each unit.

If a project extends into two or more fiscal years, a separate 1900-4 will be made for the work planned during each fiscal year.

SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

f. List materials, tools, and supplies needed for the project, quantities to be purchased from project funds and on hand, and unit prices. Enter costs of materials and tools to be purchased in the **To Be Financed** column and estimated value of materials on hand in the **Contributed** column. Do not enter any contributed value for tools or equipment that are on hand and will not be used up or worn out on the project. If more space is needed, use a supplemental page.

g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. SBW Pheromone | FISCAL YEAR 83

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Pupal survey and set out traps

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Santo	20			
Langley	20			
Snowden	15			
McCreery	15			
PER DIEM, TRAVEL AND MEALS 60 x 50			3000	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
Vehicle 1		3000	0	25	750
2		3000	0	25	750

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE	
Misc.				500

CONTRACT

TOTAL PLANNED COST — FINANCED + CONTRIBUTED

BEGIN WORK: June 10 | COMPLETE WORK: July 10

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY — DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

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INSTRUCTIONS

GENERAL:

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SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

f. List materials, tools, and supplies needed for the project, quantities to be purchased from project funds and on hand, and unit prices. Enter costs of materials and tools to be purchased in the **To Be Financed** column and estimated value of materials on hand in the **Contributed** column. Do not enter any contributed value for tools or equipment that are on hand and will not be used up or worn out on the project. If more space is needed, use a supplemental page.

g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO.

FISCAL YEAR 83

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Egg Mass Survey, Defoliation Surv of Collect Plots

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Santo - Field	12			
Lab	10			
Sawfly Field	12			
Lab	10			
PER DIEM, TRAVEL AND MEALS 24 x 50			1200	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
Vehicle		2000	0.25	500	

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE		
Misc.				100	

CONTRACT			
TOTAL PLANNED COST	FINANCED + CONTRIBUTED		

BEGIN WORK Aug 1

COMPLETE WORK Sept 1

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY

DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

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INSTRUCTIONS

GENERAL:

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SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

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g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. SBW Pheromone | FISCAL YEAR 84

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Overwintering larval survey (L2)

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Santo - Field	25			
Lab	10			
Sawfly - Field	25			
Lab	10			
PER DIEM, TRAVEL AND MEALS 50 x 50			2500	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
Vehicle		5000	0	25	1250
Snowmobile		20 days	$35/day		700

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE	
Misc.				500

CONTRACT	
TOTAL PLANNED COST (FINANCED + CONTRIBUTED)	

BEGIN WORK Feb 1 84 | COMPLETE WORK Mar 30 '84

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY | DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

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INSTRUCTIONS

GENERAL:

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SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

b. Enter daily rate, including all employer-paid benefits, for both project-financed and contributed manpower. Circle or put parenthesis around rate for contributed people.

c. Multiply days planned by daily rate and enter in the appropriate **Planned Costs** column, either **To Be Financed** or **Contributed**. Round to the nearest dollar. Enter the value of contributed cooperator time (not cash deposits) in the **Contributed** column.

d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

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g. Enter costs of any work that will be accomplished by contract. Identify contract portion of the job in the project description.

h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

4. a. Person who prepares the plan sign and date.

b. Applicable program staff people review for conformance with unit programs and standards, sign and date.

c. Unit line officer, or person designated by him, approve and date.

d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. SBW Pheromone | FISCAL YEAR 84

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN.

Defoliation survey and pupal

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Soucto - Field	15			
Lab	10			
Soucto - Field	15			
Lab	10			
PER DIEM, TRAVEL AND MEALS 30 x 50			1500	

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		
Vehicle		3000	0.25	750	

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE		
Misc.				100	
CONTRACT					
TOTAL PLANNED COST	FINANCED + CONTRIBUTED				

BEGIN WORK June 20 | COMPLETE WORK July 15

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY | DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

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INSTRUCTIONS

GENERAL:

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SPECIFIC PROCEDURE: Instructions are keyed to the five numbered blocks on the face of this form.

1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

2. a. List manpower by name, if known, or by position and grade. Show number of man-days planned on the project for each. Include contributed manpower not charged directly to project funds. Enter days to be contributed by a cooperator on a separate line. If more room is needed, write two names in each space or list on a supplemental page.

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d. Enter any costs for per diem, travel, and meals.

e. List vehicles and other equipment needed for the project, months (if any) to charge fixed ownership rate to the project, estimated hours or miles of use, and applicable FOR and use rate. Enter project cost for each piece of equipment, to the nearest dollar, in the **To Be Financed** column. If any equipment FOR cost or use is contributed by another project or a cooperator, enter this value in the **Contributed** column.

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d. After approval, unit financial management officer or his designated representative verify finance and accounting data, date, and certify that allocation has been processed.

5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

USDA–FOREST SERVICE

PROJECT WORK PLAN

1. UNIT

SUB-UNIT

PROJECT NO. SBW Pheromone

FISCAL YEAR 84

PROJECT NAME, LOCATION, DESCRIPTION, ACCOMPLISHMENT TARGET, AND MANAGEMENT PLAN

Data Analysis and Preparation of Report.

2. MANPOWER (List by Name)	DAYS	DAILY RATE	PLANNED COSTS TO BE FINANCED	PLANNED COSTS CONTRIBUTED
PROJECT LEADER OR FOREMAN Souto	30			
Sawfly	10			
PER DIEM, TRAVEL AND MEALS				

EQUIPMENT (F.S. and Rental)	MONTHS F.O.R.	HOURS OR MILES	F.O.R. OR USE RATE		

MATERIALS AND SUPPLIES	QUANTITY TO BUY	QUANTITY ON HAND	UNIT PRICE		
Computer				1000	
CONTRACT					
TOTAL PLANNED COST	FINANCED + CONTRIBUTED				

BEGIN WORK Aug 1 '84

COMPLETE WORK Oct 1 84

SPECIAL SKILLS NEEDED	DAYS	WHEN

4. PROPOSED BY — DATE

STAFF REVIEW BY

APPROVED BY

FUNDS ALLOCATED BY

3. FINANCE AND ACCOUNTING DATA

APPROPRIATION	STAT CODE	ACCOUNT OR ACTIVITY	FUNCTION MAJOR	FUNCTION SUB	SUB-UNIT	DOLLARS PLANNED AND ALLOCATED
TOTAL ALLOCATED						

5. ACCOMPLISHMENT RECORD

	DATE	INITIAL

1900-4 (11/77)

PLANNING AND ACCOMPLISHMENT NOTES

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1. a. Print unit and subunit names and code numbers.

b. Enter project number and fiscal year. Project numbers may be either structured or unstructured as needed for Regional or local use.

c. Enter name, location, narrative description of project, and accomplishment target. Refer to relevant enviornmental analyses and management plans.

d. State planned dates to begin and complete project.

e. Indicate special skills needed, such as engineer, landscape architect, or soil scientist, that are not available on the planning unit or subunit.

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h. Add both **To Be Financed** and **Contributed** cost columns. Enter sum of financed plus contributed costs in the **Financed Plus Contributed** block.

3. Enter finance and accounting data in the standard format for all funds available to complete this project. Include both appropriated and deposited cooperative funds. Total allocated must equal total of the **Planned Costs To Be Financed** column. If not, reduce units to be accomplished or otherwise adjust plan to conform with available funds.

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5. Project manager enter accomplishment at least quarterly for projects active during the quarter and certify when project is completed. Inspecting officers should also record accomplishment, especially adherence to standards and quality of work.

GPO 922-975

APPENDIX B

SBW Pheromone Prospectus

PROSPECTUS #5

Spruce budworm pheromone trap evaluation in outbreak areas.

Objective: To compare spruce budworm population estimates and accuracy of damage prediction between pheromone traps, egg-mass and overwintering larval survey methods.

Justification: Egg-mass surveys and overwintering larval surveys are used to predict spruce budworm damage and to determine need for suppression. These methods are time consuming, expensive and late in the planning process for overwintering larval surveys. CANUSA research has succeeded using pheromone traps to detect spruce budworm in low population areas. Researchers (Dr. D. Allen) feel that pheromone traps may give equal prediction accuracy at lower cost and earlier in the planning season than egg-mass and overwintering larval surveys.

Methods: CANUSA protocol (Dr. D. Allen) will be followed for the evaluation. 20 clusters of 5 sample points each will be established in softwood stands on Maine Indian lands. The clusters will be grouped to provide comparison within cluster, and to provide group comparisons in several geographical areas. Regression analysis will be used to compare pheromone trap catches with egg-mass and overwintering larval and pupal populations and defoliation (CANUSA program). The evaluation will be done in 1982, '83, and '84, and final analysis will be completed in 1984.

Reporting Schedule: Progress reports will be prepared after each egg-mass survey in FY 1982 and FY 1983. A final report will be prepared by the end of FY 1984.

Estimated Budget:

FY 1982	$ 8,400
FY 1983	11,750
FY 1984	8,425
Total	$ 28,575

APPENDIX C

Field Instructions

For Evaluation of Spruce Budworm Outbreaks

With Pheromone Moth Traps

APPENDIX C

FIELD INSTRUCTIONS

FOR EVALUATION OF SPRUCE BUDWORM OUTBREAKS

WITH PHEROMONE MOTH TRAPS

A. Cluster Selection

1. Priorities

First - Softwoods - Spruce, sprayed and unsprayed in east and west areas.

Second - Balsam fir in western areas; adjoining or part of spruce clusters.

Third - Mixed woods, spruce clusters

2. Stand Definitions

Softwoods - 80% or more in spruce/fir

Mixed woods - 30-40% spruce/fir

Stand - 5 acres or more of similar type

Spruce - White or red spruce

Fir - Balsam fir

Sample trees - spruce/fir 4 inches DBH or more in upper crown positions; selected for sampling.

3. Establishment

a. Reconnaissance of the stand to assure that trees are available at all 5 points.

b. Select central point "C", mark a tree for pheromone trap (any species); a branch available at about 6 feet above ground. Select 2 sample trees closest to the trap tree (trap may be placed also on the sample tree); mark trees.

c. Proceed to "N" point about 2 chains (40m) and find a trap tree; select 2 sample trees nearby and mark them.

d. Repeat step C to East, South and West.

e. Mark a trail with ribbons for re-entry.

B. Tree and Plot Marking

1. Use ribbons acceptable to the land managers but make sure that they are distinct from ribbons in the area.

2. Paint roadside tree for entry to the cluster and show cluster number. Use ribbon line to reach center point.

3. Each sample tree should have two ribbons around trunk - labeled and one aluminum tag with label.

4. Draw a detailed map showing and identifying nearest road, and the distance between the entry tree and an obvious point on the road.

5. Tree codes:

   a. Area - (A)lder stream - west
      (Q)uoddy - east
   b. Cluster - sequence 1-24
   c. Point - "C" center, "N"; "E"; "S"; "W"
   d. Host - "S" spruce "F" fir
   e. Tree - 1 or 2

C. Pheromone Traps

1. Pheromone traps will be obtained from Dr. R. Carde.

2. Pheromone lures and Vapona strips will be obtained from Dr. D. Allen.

3. Traps will be deployed at least 1 week before moth flight, or during the pupal survey.

4. Traps will be collected during the egg mass survey.

5. Traps will be hung 6 feet above the ground at each sample point; make sure that at least a 1 foot area around the trap is clear of twigs and limbs to allow free moth flight.

D. Stand Description - Forms: "Number of Host Trees by Diameter Class and Basal Area of Study Plots"; and "Plot Description (site)".

1. Take 2 prism points (10 BAF) per sample point (plot), or 10 prism points per cluster.

2. Use one form per sample point (plot).

3. Diameter classes for inventory begin with 9 cm (3.5 inches), or 4 inch class and are recorded in 1 inch classes.

4. Host trees in the prism point are recorded by DBH classes.

5. Stand composition is recorded by tally of all the trees (above 3.5 inches) at the prism point.

6. Make sure that the total number of host trees on both entries agrees in number, and the total tally agrees with Total Basal Area.

7. Determine age for 1 sample tree per point from increment cores at DBH.

8. Describe site conditions - aspect, elevation history and provide a map.

9. Obtain DBH measurements for all sample trees in a cluster.

E. Climatological Record (Form: Climatological Data)

1. One record will be obtained for the Alder Stream Township and one record for the T5ND Township.

2. Complete form from weather station records.

F. Defoliation Estimates

1. Use branches collected for overwintering larval (L_2) Survey. (1 whole branch/tree; 2 branches/point)

2. Systematically, estimate defoliation class (Fette's Value) for 10 current year's shoots (5 on left side and 5 on right side for each branch.

3. Record data on the form.

Table 1. Sampling design for prediction of spruce budworm populations and defoliation - Pheromone Study, Maine.

Sample Items	Western Maine								Eastern Maine				Total		
	Softwoods				Mixed woods				Softwoods						
	Spray		Unspray		Spray		Unspray		Spray		Unspray				
	S	F	S	F	S	F	S	F	S	F	S	F	W	E	T
No. sample clusters	3	3	3	3	3	-	3	-	3	-	3	-	18	6	24
Sub samples:															
Points-5/cluster	15	15	15	15	15	-	15	-	15	-	15	-	90	30	120
Tree-2/point	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Prespray-1/point	15	15	15	15	15	-	15	-	15	-	15	-	90	30	120
Branches:															
L_2-1/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
L_4-2/tree	60	60	60	60	60	-	60	-	60	-	60	-	360	120	480
Pupal-2/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Egg mass-2/tree	30	30	30	30	30	-	30	-	30	-	30	-	180	60	240
Pheromone traps:															
1/point	15	15	15	15	15	-	15	-	15	-	15		90	30	120

S - Spruce
F - Fir
W - West
E - East
T - Total

NUMBER OF HOST TREES BY DIAMETER CLASS AND BASAL AREA OF STUDY PLOTS

CLUSTER _____

POINT _____ DATE _____ CREW _____

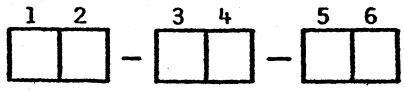
D.B.H. (centimeters)	DIAMETER CLASS OF HOST SPECIES					STAND COMPOSITION - BASAL AREA BY SPECIES		
	W.S.	R.S.	B.S.	B.F.	TOTAL	SPECIES	TALLY	TOTAL
9.0-11.4						Red maple		
11.5-13.9						Hard maple		
14.0-16.4						Striped maple		
						Gray birch		
16.5-18.9						White birch		
						Yellow birch		
19.0-21.4						Black birch		
						Jack pine		
21.5-23.9						White pine		
						Jack pine		
24.0-26.4						Hemlock		
						Red cedar		
26.5-28.9						White-cedar		
						Quaking aspen		
29.0-31.4						Bigtooth aspen		
						Black cherry		
31.5-33.9						White ash		
						Black ash		
34.0-36.4						Hophornbeam		
						White spruce		
36.5-38.9						Red spruce		
39.0-41.4						Black spruce		
41.5-43.9						Balsam sir		
44.0-46.4								
46.5-48.9								
49.0-51.4								
TOTALS						TOTALS		

1) W.S. - White spruce
R.S. - Red spruce
B.S. - Black spruce
B.F. - Balsam fir

2) Specify BAF of prism used _____

PLOT DESCRIPTION (SITE)

PLOT NUMBER



Blocks 1 & 2 = code for state or province

01=NY; 02=Ver; 03=NH; 04=Quebec; 05=New Foundland; 06=IP; 07=WV; 08=Mich.; 09=Maine; 10=New Brunswick

Blocks 3 & 4 = number assigned to plot containing set of traps (i.e., 01; 02; 03 ... 20 etc.)

Blocks 5 & 6 = year of study - last two digits

SPECIES DESCRIPTION

Species _____ 7–9

Basal Area _____ 10–12

Mean Age[1] _____ 13–15

Species _____ 16–18

Basal Area _____ 19–21

Mean Age[1] _____ 22–24

Species _____ 25–27

Basal Area _____ 28–30

Mean Age[1] _____ 31–33

Species _____ 34–36

Basal Area _____ 37–39

Mean Age[1] _____ 40–42

Other Species _____ 43–45

Basal Area _____ 46–48

[1]Host species only.

ASPECT

Percent Slope _____ [ ][ ] 61-62

Direction of Slope _____ [ ][ ][ ] 63-65

ELEVATION _____ [ ][ ][ ][ ] 66-69

MANAGEMENT HISTORY: _____

_____

_____

_____

HISTORY OF NATURAL DISTURBANCE (e.g., fire, defoliation, etc.): _____

_____

_____

_____

CARD NUMBER [1] 80

CLIMATOLOGICAL DATA

PLOT NUMBER

1 2 - 3 4 - 5 6

Location of Station in relation to plot: _____

7-9 DATE[1] Day of Year	TEMPERATURE[2] 10-11 Max. (C°)	12-13 Min. (C°)	14-15 Rainfall[3] (mm)	COMMENTS

[1]Actual day expressed as a three digit number (001-365)

[2]Nearest whole degree centigrade

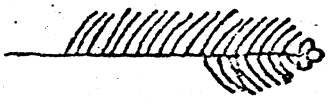
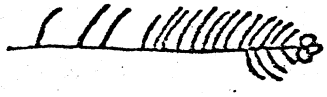
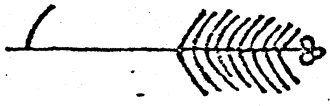
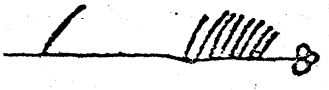
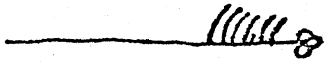
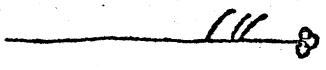
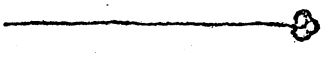
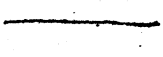
[3]Nearest whole millimeter

Figure 2

SPRUCE BUDWORM DEFOLIATION WORKSHEET

CLUSTER _____ DATE COLLECTED _____

SAMPLE POINT _____ TREE Species _____

Defoliation Category		Percent Defoliation per Category
0		×0
1		×5
2		×15
3		×25
4		×35
5		×45
6		×55
7		×65
8		×75
9		×85
10		×95
11		×100
12		×100

	Branch Tips	Defoliation Category	Percent of Defoliation
TREE # 1	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
TREE # 2	11		
	12		
	13		
	14		
	15		
	16		
	17		
	18		
	19		
	20		

Total Defoliation Percentage _____

Percentage ÷ 20 = _____

Mean Defoliation _____